

# **TENDER DOCUMENTS**

## **SUBSECTION 6.15 TEMPORARY STRUCTURES**

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## SUBSECTION 6.15 TEMPORARY STRUCTURES

### 6.15.1 GENERAL

- 6.15.1.1 This subsection describes the requirements relating to the design, supply, installation, inspection and maintenance, by the Contractor, of all temporary structures such as the cofferdams, platforms, walkways, scaffolding, stairs, ladders, access devices, barges or other floating installations including, without however being limited to, the enclosures, formwork, bracing, shoring, protection bridging, supports and other temporary structures necessary for the safe and expeditious performance of the work as well as the work supervision by the Owner and its representatives.
- 6.15.1.2 The access devices provided by the Contractor shall comprise equipment such as cranes and working platforms or platform lifts, stairs, access walkways or any other access devices to provide access to the work sites at all times for the workers, the Engineer, the inspectors and any other representative of the Engineer.
- 6.15.1.2.1 The Contractor's employees shall not walk directly on bridge members. Access walkways or other additional access devices shall be installed to allow them to move.
- 6.15.1.2.2 The Contractor's employees shall not walk in a lane open to traffic. The Contractor shall provide safe access to the various platforms and enclosures.

### 6.15.2 MEASUREMENT UNITS

- 6.15.2.1 The measurement units and respective symbols thereof used in this subsection are described as follows:

Measurement Unit	Designation	Symbol
length	metre	m
length	millimetre	mm
mass	kilogram	kg
stress, pressure	kilopascal	kPa
speed	kilometre/hour	km/h
illuminance	lux	lx

### 6.15.3 REFERENCE STANDARDS

- 6.15.3.1 The Contractor shall, while taking into account the specifics of the worksite, design, erect, maintain and use all temporary structures in strict accordance with the applicable federal, provincial or other laws, regulations, codes and standards and to the entire satisfaction of the organizations involved, including the Quebec *Commission des normes, de l'équité, de la santé et de la sécurité du travail* (CNESST).

6.15.3.2 When the Engineer so requests, the Contractor shall demonstrate thereto, with the necessary supporting documentation, that all legal and contractual requirements respecting the temporary structures are met.

#### **6.15.4 EXECUTION OF WORK**

##### 6.15.4.1 TEMPORARY STRUCTURES

6.15.4.1.1 The Contractor shall design, supply, construct and maintain all the temporary structures needed to carry out the work safely and expeditiously.

6.15.4.1.2 The Contractor shall provide access structures that are large and strong enough to safely accommodate the Contractor's, the Owner's and the Owner's representatives' personnel at all times, especially for the supervision of the worksite and the work.

6.15.4.1.3 When required, the Contractor shall install the temporary structures in such a way as to leave a free and safe passage to pedestrians and cyclists on sidewalks and bicycle paths.

6.15.4.1.4 The Contractor shall prevent access to the temporary structures by the public. The Contractor shall, in particular, ensure that the public does not have access to any cables suspended from the temporary structures.

6.15.4.1.5 At least fourteen (14) days prior to the assembly, the Contractor shall provide the Engineer with a copy of the plans, technical data sheets and design notes for the temporary structures that were forwarded to the CNESST. The documents provided shall clearly indicate the method and sequence of installation and relocation of all the temporary structures as well as the method of disassembly.

6.15.4.1.6 The design of the temporary structures, including the plans and design notes, shall meet the requirements of the CNESST and comply with the Quebec *Construction Code* – Chapter 1, *Building*, the *National Building Code of Canada 2010*, the *Canadian Highway Bridge Design Code (CAN/CSA S6)*, the *Safety Code for the Construction Industry (CQLR c. S-2.1, r.4)* and with the CSA standards pertaining to the types of construction materials used and shall be sent to the CNESST and to the Engineer for review.

6.15.4.1.6.1 Without limiting the scope of paragraph 6.15.4.1.5, the Contractor shall, no later than fourteen (14) days from the date of the written notice of Contract award, submit to the Engineer, for review, the plans and design notes for the temporary structures and the technical data sheets of all components such as the cables and trusses used for the construction of said temporary structures. The Contractor may not start constructing the enclosures, scaffolding, access walkways and other access devices until it has received the Engineer's comments.

6.15.4.1.6.2 The Contractor's schedule shall allow enough time for carrying out all verifications and obtain all the required authorizations.

- 6.15.4.1.6.3 The plans shall indicate the dimensions as well as the specifications regarding the components, materials and design loads used, the load combinations permitted and the splicing and connection details, including the nails, clamps and other fasteners.
- 6.15.4.1.6.4 The plans and design notes for the temporary structures shall be signed and sealed by the Contractor's design engineer, who shall be a member of the *Ordre des ingénieurs du Québec* (OIQ) and have at least ten (10) years of relevant experience. The Contractor's design engineer shall have previously designed similar temporary structures in at least three (3) recent projects of the same scope.
- 6.15.4.1.6.5 Any worksite modifications of the temporary structures shall be approved by the Contractor's design engineer.
- 6.15.4.1.6.6 Throughout the entire course of the work, including, without however being limited thereto, the use and dismantling of the temporary structures, all parts and components of the temporary structures shall be designed in such a way as to prevent them from shifting or falling.
- 6.15.4.1.6.7 Unless otherwise directed in writing by the Contractor's design engineer, the total thickness of the shims used for worksite adjustments during the construction of the temporary structures shall not exceed 150 mm.
- 6.15.4.1.6.8 The shims shall be secured at all times to prevent them from shifting as a result of vibrations or for any other reason.
- 6.15.4.1.7 The temporary structures shall be constructed in accordance with the *Contractor's plans* and as directed by the Engineer. The Contractor shall allow a minimum of fourteen (14) days for the Engineer to review the *Contractor's plans* for the temporary structures before starting their construction in accordance with Article 5.14.2 *Elements to be considered in Planning* of Section 5 *Standard Administrative Conditions*.
- 6.15.4.1.8 When temporary structures are being installed for the first time and every time they are modified or relocated, they shall be inspected by the Contractor's design engineer, who shall issue an inspection report certifying that the structures comply with the approved plans submitted to the Engineer.
- 6.15.4.1.9 A copy of the *Contractor's plans*, including the plans for the temporary structures, and the inspection certificates, shall be available on the worksite throughout the duration of the work.

- 6.15.4.1.10 The Contractor shall install signs indicating the maximum permitted loads at the access points to its platforms. The Contractor shall submit said signs to the Engineer for review prior to installation on the platforms. In order to facilitate the workers' interpretation of the maximum loads permitted on the platforms, the signs shall indicate the maximum number of persons, the maximum thickness of abrasives or demolition debris and the maximum weight of construction equipment allowed on the platforms at all times. Throughout the construction period, the Contractor shall ensure that the equipment and debris are disposed of or removed so that the weight of the residues, equipment and workers does not exceed the calculated operating load posted on the signs.
- 6.15.4.1.11 The suspension of the temporary structures from bridge members or other structure elements shall be designed so as to respect the structural integrity of these members or structure elements. The plans shall indicate the loads transmitted to the different members or structure elements. The Contractor shall ensure, by the supporting calculation, that the members or structure elements have the capacity to bear all the additional loads thereto transmitted. If it is not the case, the Contractor shall modify its structures accordingly at no additional cost to the Owner. The Contractor's design engineer shall submit the design notes for the temporary structures to the Engineer.
- 6.15.4.1.12 No drilling or alteration of a bridge member for the installation of fasteners is permitted. The fasteners shall be designed to go around the members. The fasteners shall be located at the truss nodes or close to the bearings. Intermediate supports shall be provided as required for uniform load distribution.
- 6.15.4.1.13 The temporary structures shall be designed and constructed in such a way as to prevent any objects, residues or debris from falling and shall comprise enclosures, tarpaulins, fabric or screens to protect property and people during the work, where necessary. When designing temporary structures, the Contractor's design engineer shall take the wind load into consideration and shall specify it on the plans.
- 6.15.4.1.14 Temporary structures that are subjected to winter conditions shall be cleared of snow and ice by the Contractor. The Contractor shall take appropriate measures to avoid the accumulation of unforeseen loads.
- 6.15.4.1.15 The Contractor's electrical installations shall comply with Article 5.16.8 *Electricity and Temporary Lighting* of Section 5 *Standard Administrative Conditions*.
- 6.15.4.1.16 The components of the temporary structures shall be chosen so that fire hazards are eliminated at the source. In addition, these structures shall be equipped with devices that make it possible to fight fires immediately and effectively.
- 6.15.4.1.17 The minimum live loads to be used for designing the platforms and components and fasteners thereof shall be of at least 2.4 kPa.

- 6.15.4.1.18 The Contractor shall assume all risks to which its temporary structures and equipment left on site are exposed to, both during and outside of work periods. The Contractor shall, at no additional cost to the Owner and to the satisfaction of the Engineer, take all necessary measures to render the temporary structures inaccessible to the public.
- 6.15.4.1.19 The Contractor shall submit to the Engineer, for review, a detailed procedure, signed and sealed by the Contractor's design engineer who designed the temporary structures, for the jacking, relocation and disassembly of the temporary structures. No jacking, relocation or disassembly of the temporary structures shall be carried out before this procedure has been reviewed by the Engineer.
- 6.15.4.1.20 For each temporary structure, the Contractor shall provide the Engineer with a certification signed by the Contractor's design engineer stating that the temporary structure was erected in compliance with the *Contractor's plans* and that it is safe for workers and users. No work shall begin until the report required under paragraph 6.15.4.1.8 of this subsection has been issued.
- 6.15.4.1.21 The Contractor shall notify the Engineer at least twenty-four (24) hours in advance of the visit of the Contractor's engineer who designed the temporary structures, because the Engineer must accompany the Contractor's design engineer during each visit aiming at the verification and certification of the compliance of the temporary structures as required in paragraph 6.15.4.1.8 of this subsection. All statements of compliance of the temporary structures shall be accompanied by a site visit.
- 6.15.4.1.22 Protective nets shall be installed by the Contractor around the perimeter of the platforms to prevent the projection of any pieces of steel, concrete or other material outside the work area. The design of the platforms shall take into account the additional loads caused by the protective nets.
- 6.15.4.1.23 Before any work requiring the use of platforms begins, the Contractor shall prepare and submit to the Engineer, for review, a diagram identifying the distribution of the live loads on the working platforms. This diagram shall include the location and a description of the equipment, materials and workers to be distributed on the platforms. The load distribution diagram shall bear the seal and signature of the Contractor's design engineer who designed the platforms. The load distribution diagram shall be displayed at all times on the working platform and shall be accessible to all stakeholders.
- 6.15.4.1.24 The platforms shall be accessible at all times via a ladder or stairway accessible from the ground or water, as applicable. The Contractor shall, however, ensure that the ladders or stairs are accessible only to authorized persons. Upon commencement of the work, the Contractor shall make every effort to design, have the plans reviewed, and install the platforms, work ladders, or stairs as soon as possible so that the survey for damage to be conducted on the elements concerned can begin at the earliest.

6.15.4.1.25 The Contractor shall leave the scaffolding, access walkways and other access devices in place for a minimum period of twenty-four (24) hours after the completion of each work phase to allow the Engineer to verify the quality of the work. This period may occasionally be extended if weather conditions so require.

6.15.4.1.26 Failure by the Contractor to meet the requirements of paragraph 6.15.4.1.24 of this subsection will result in the application of Article 5.35.11 *Damages for Failure to Comply with the Requirements related to Temporary Structures* of Section 5 *Standard Administrative Conditions*.

#### 6.15.4.2 CLEARANCE OF THE TEMPORARY STRUCTURES

6.15.4.2.1 When temporary structures are constructed above traffic lanes, parking lots or buildings, the Contractor shall ensure that the clearance under them is at least 5.5 m.

6.15.4.2.2 When possible, the Contractor shall post the actual height minus 300 mm and coordinate with the Engineer the communication with the transportation networks, the *ministère des Transports du Québec* (MTQ) and the Owner.

6.15.4.2.3 The temporary structures constructed along traffic lanes shall be protected from road impacts by the installation of an adequate safety device, if they do not have sufficient lateral clearance.

6.15.4.2.4 The temporary structures constructed above a body of water shall have the air draught required for the passage of boats.

#### 6.15.4.3 SUPPORT AND ANCHORING OF THE TEMPORARY STRUCTURES

6.15.4.3.1 On the Jacques Cartier Bridge, no loads from the installation of the temporary structures shall be applied unto the railing, deterrent fence, rigid concrete barriers, bicycle path and sidewalk.

6.15.4.3.2 The installation of anchors on precast prestressed and/or post-tensioned concrete elements is prohibited.

6.15.4.3.3 Drilling steel members to construct the temporary structures is prohibited. The Contractor may, however, replace rivets with bolts to secure the temporary structures.

6.15.4.3.4 Drilling and the use of anchors in the new concrete are permitted only with an authorization of the Engineer.

#### 6.15.4.4 SPECIFIC MEASURES FOR COFFERDAMS

6.15.4.4.1 Cofferdams are required when work on piers under the water level must be carried out dry.



- 6.15.4.4.2 The construction of the cofferdams shall meet the following requirements:
- 6.15.4.4.2.1 the Contractor shall determine the types of cofferdams and methods of construction and dismantling thereof, in function of the characteristics of the soil encountered and so as not to pollute the environment;
    - 6.15.4.4.2.1.1 the Contractor shall design the cofferdams considering the sediment, soil and rock characteristics described in a sediment, soil and rock reconnaissance survey provided by the Owner;
    - 6.15.4.4.2.1.2 the Contractor shall design the cofferdams considering the likely water levels on the work site as provided by Fisheries and Oceans Canada.
  - 6.15.4.4.2.2 the cofferdams shall be self-supporting and shall, therefore, not rest on piers.
  - 6.15.4.4.3 Prior to dismantling the cofferdams, the Contractor shall clean up the area and remove and collect any residue that might escape or remain suspended in the water.
- 6.15.4.5 PUBLIC UTILITIES
- 6.15.4.5.1 The temporary structures, the material and the work equipment shall not be supported and/or attached to utility equipment and supports under any circumstances.
  - 6.15.4.5.2 Protective screens and/or nets shall be installed by the Contractor to ensure the protection of the facilities belonging to the Owner and to public utilities.
- 6.15.4.6 SPECIFIC MEASURES FOR ENCLOSURES
- 6.15.4.6.1 If required to ensure the protection of workers, the public or users, or under federal, provincial or other regulations, standards, codes or acts, enclosures shall be designed and constructed so as to provide protection on all sides of the areas to be treated. The enclosures shall, until completion of the work, prevent dust and other materials used or produced during the surface preparation, cleaning and painting from escaping.
  - 6.15.4.6.2 The enclosures shall withstand wind pressure as defined in the *National Building Code of Canada 2010* and the *Canadian Highway Bridge Design Code (CAN/CSA S6)*.
  - 6.15.4.6.3 The walls of the enclosures all along the traffic lanes (for vehicles, pedestrians and cyclists) shall be made of rigid materials (e.g. plywood) that can withstand wind loads and air movement created by passing trucks. The rigid materials shall be fixed accordingly.
  - 6.15.4.6.4 The materials collected or accumulated inside the enclosures shall be contained in such a manner as to prevent them from escaping. The collected materials shall be removed from the worksite in accordance with the requirements of subsection 6.13 *Environmental Protection*.

- 6.15.4.6.5 The Contractor shall ensure that the materials collected or accumulated are removed so that the weight of the materials, equipment and workers on the scaffolding, access walkways and other access devices does not exceed the load indicated on the plans of said scaffolding, access walkways and other access devices.
- 6.15.4.6.6 Before relocating or removing the enclosures, scaffolding and walkways, the Contractor shall clean up the area and remove and collect any residue that might escape or remain suspended in the air.
- 6.15.4.6.7 During the performance of the cleaning and painting work and during inspections of the work by the Engineer and the painting inspectors, the Contractor shall provide a lighting level equivalent to at least 538 lx inside the enclosures. For information purposes, this lighting level corresponds to the lighting level that would normally be found in offices.
- 6.15.4.6.8 The Contractor's enclosure system shall not encroach on the bridge and access ramp traffic lanes when open to traffic.
- 6.15.4.6.9 The enclosure system shall not obstruct the overhead signage or surveillance cameras.
- 6.15.4.6.10 The Contractor shall ensure that there is no water accumulation on the fabric forming the roof of the enclosures.
- 6.15.4.6.11 The Contractor shall take all necessary precautions to prevent objects of any kind from falling from the structures. The Contractor shall supply and install, on the joints of its platforms, geotextile fabric or any other means approved by the Engineer for containing dust, abrasives, paint and any other residues. The equipment and materials shall be rendered inaccessible to the public.

#### 6.15.4.7 SPECIAL MEASURES FOR LIFTING BY CRANE

- 6.15.4.7.1 For the lifting of loads heavier than 5,000 kg from the ground, the Contractor shall submit to the Engineer, for review, a lifting plan containing, at a minimum, the following information:
  - 6.15.4.7.1.1 the crane positioning at the x, y and z axis;
  - 6.15.4.7.1.2 the ground capacity and the dimension relative to the deployment of the stabilizers;
  - 6.15.4.7.1.3 the crane maintenance certificate, less than one (1) year old;
  - 6.15.4.7.1.4 the details of the crane loads and of the rigging, the capacity thereof and the safety factors;
  - 6.15.4.7.1.5 the crane charts;

- 6.15.4.7.1.6 the utilization factors;
  - 6.15.4.7.1.7 the maximum wind speeds for the crane and the load;
  - 6.15.4.7.1.8 the identification of the lifting points of the load to be lifted;
  - 6.15.4.7.1.9 where needed, the use of lifting brackets or trusses;
  - 6.15.4.7.1.10 the use of load distribution cushions under the stabilizers.
- 6.15.4.7.2 For lifting operations on a structure or bridge deck, the Contractor shall submit to the Engineer, for review, a lifting plan containing, at a minimum, the following information:
- 6.15.4.7.2.1 the crane positioning at the x, y and z axis;
  - 6.15.4.7.2.2 the ground capacity and the dimension relative to the deployment of the stabilizers;
  - 6.15.4.7.2.3 the crane maintenance certificate, less than one (1) year old;
  - 6.15.4.7.2.4 the details of the crane loads and of the rigging, the capacity thereof and the safety factors;
  - 6.15.4.7.2.5 the crane charts;
  - 6.15.4.7.2.6 the utilization factors;
  - 6.15.4.7.2.7 the maximum wind speeds for the crane and the load;
  - 6.15.4.7.2.8 the identification of the lifting points of the load to be lifted;
  - 6.15.4.7.2.9 where needed, the use of lifting brackets or trusses;
  - 6.15.4.7.2.10 the use of load distribution cushions under the stabilizers;
  - 6.15.4.7.2.11 the design notes for the capacity of the structure and calculation of the local effect;
  - 6.15.4.7.2.12 the design notes for the capacity of the structure and calculation of the overall effect;
  - 6.15.4.7.2.13 the positioning of the stabilizers on the main elements, girders, diaphragms and deck ribs;
  - 6.15.4.7.2.14 the distance of the drains, joints or discontinuities of at least 600 mm.

#### 6.15.4.8 TEMPORARY SOIL SUPPORT

- 6.15.4.8.1 At least fourteen (14) days before the start of the work, the Contractor shall submit to the Engineer, for review, a copy of the plans, technical data sheets and design notes of the type of soil support proposed to ensure the local and overall stability of the soils to support. The documents provided shall clearly indicate the method and sequence of implementation of the soil support. The Contractor shall be solely responsible for the method thereby selected and of the implementation thereof, regardless of the way the supports are indicated on the plans.
- 6.15.4.8.2 The design notes and plans of the soil support shall be signed and sealed by an engineer who is a member of the OIQ and who has a minimum of ten (10) years of relevant experience. The Contractor's engineer shall carry out his design following the recommendations of a geologist who is a member of the *Ordre des géologues du Québec* and who has a minimum of ten (10) years of experience.
- 6.15.4.8.3 The Contractor's plans and design notes shall contain, at a minimum, the following information:
- 6.15.4.8.3.1 the materials;
  - 6.15.4.8.3.2 the precise location;
  - 6.15.4.8.3.3 the soil density;
  - 6.15.4.8.3.4 the calculation assumptions;
  - 6.15.4.8.3.5 the hydrostatic pressure;
  - 6.15.4.8.3.6 the verticality control points by survey and the permitted deviations;
  - 6.15.4.8.3.7 the internal angles of friction of the soil;
  - 6.15.4.8.3.8 the safety factors of the main and secondary elements;
  - 6.15.4.8.3.9 the permitted vibrations;
  - 6.15.4.8.3.10 the anticipated behavior of the temporary retaining wall.
- 6.15.4.8.4 The Contractor shall implement a daily monitoring program by surveying the retaining walls. In no event shall the markers be moved or altered during work without the authorization of the Engineer.

#### 6.15.4.9 NIGHT WORK

6.15.4.9.1 The Contractor shall supply, install and maintain the lighting, supervision, barriers and all other equipment required for carrying out work at night. The temporary structures shall include a lighting system that allows workers to work without any supplementary lighting.

#### 6.15.4.10 TEMPORARY PLATES AND RAMPS

6.15.4.10.1 The Contractor shall install steel plates or any other similar device to cover temporary openings in traffic lanes, bicycle paths and sidewalks. These steel plates shall be chamfered on the edges following a slope of at least 1:10 if they are thicker than 8 mm and result in a variation of level in the traffic lanes, bicycle paths and sidewalks.

6.15.4.10.2 The steel plates or any other similar devices shall be designed to withstand the applicable overload and shall have a dynamic load factor of at least 0.50 in the roadway traffic lanes. The steel plates shall be solidly fixed in order to prevent any lateral, longitudinal or vertical movement. The design and fixation method of the plate shall take the braking and uplift loads into account. The surfaces of all plates exposed to traffic (vehicles, cyclists and pedestrians) shall have a non-slip coating.

#### 6.15.4.10.3 Sidewalks and bicycle paths

6.15.4.10.3.1 During the work, the Contractor shall install temporary ramps when abrupt changes in the level of sidewalks and bicycle paths exceed 19 mm. The slope of the temporary ramps shall be at least 1:10. Ramps may be made of wood, concrete or asphalt concrete, as appropriate. The type of proposed temporary ramp shall be submitted to the Engineer for review.

6.15.4.10.3.2 The Contractor shall mark or identify, with yellow reflecting strips, the abrupt changes in the level along the sidewalks and bicycle paths.

#### 6.15.4.10.4 Traffic lanes

6.15.4.10.4.1 During the work, the Contractor shall install temporary ramps when abrupt changes in the level of traffic lanes exceed 19 mm. The temporary ramps shall be made of asphalt concrete, unless otherwise indicated on the plans. The table below shows the minimum slopes to be respected in function of the posted speed and the height of the change in the level of traffic lanes.

<b>Posted Speed</b>	<b>Height of the Change in Level</b>	<b>Minimum Slope of the Temporary Ramp</b>
Less than or equal to 50 km/h	Less than 63 mm	1:60
	Over 63 mm	1:80
Over 50 km/h	Over 19 mm	1:80

6.15.4.10.4.3 The type of proposed temporary ramp shall be submitted to the Engineer for review. The Owner reserves the right, in order to ensure the comfort and safety of users, to request that the Contractor install temporary ramps with slopes different from those specified in the table above.

#### 6.15.4.11 PROTECTION OF THE BICYCLE PATHS AND PEDESTRIAN CROSSINGS

6.15.4.11.1 When the work is carried out along a bicycle path or a pedestrian crossing, the Contractor shall supply and install a protection platform above the bicycle path or pedestrian crossing before the work starts. The protection platform for the bicycle path and pedestrian crossing cannot transfer any loads to the bridge steel structure or concrete deck. The protection platform shall meet, at a minimum, the following requirements:

- 6.15.4.11.1.1 the protection platform shall cover the entire travelled width, plus 0.5 m on each side. The minimum clearance height shall be 2.5 m;
- 6.15.4.11.1.2 the minimum live loads to use for the design of the protection platform, and components and fasteners thereof shall be of 2.4 kPa;
- 6.15.4.11.1.3 protective nets, free of holes, shall be installed vertically by the Contractor on each side of the platforms to prevent any projections from falling tools, materials or equipment;
- 6.15.4.11.1.4 the protection platform shall be watertight;
- 6.15.4.11.1.5 a minimum lighting of 4 lx shall be maintained for the bicycle paths and pedestrian crossings.

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**END OF SUBSECTION**